DRD
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# Program Plans - Partial Expansion of Tobacco with Existing DIET Process Equipment

## Project Statement

Develop processing schemes to produce partially expanded tobacco with existing DIET process equipment for inclusion in cigarette blends, which will reduce cigarette density to 0.18 g/cc while maintaining subjective and physical characteristics.

## Project Objectives

For all Philip Morris brands, determine acceptable combinations of expansion feedstock and tower processing conditions to meet the criteria of the project statement and evaluate their economic impact as outlined below.

1. Determine the relationship between tower operating conditions (temperature, tobacco feed rate, gas composition, gas velocity) and subjective/physical properties for each tobacco type (bright, burley, oriental).

2. Compare the effect of blend expansion in various combinations with the expansion of individual blend components on subjective/physical properties.

3. Determine the contribution of DIET and ES components to subjective/physical properties both as standard expanded products and as included in partial expansion.

4. Analyze blend similarities and production requirements for all brands.

5. Propose one or more processing schemes for detailed physical, chemical, subjective, and economic evaluation.

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## Background

Over the past year, several groups including Product Development and the Leaf Blending Group have evaluated "partial expansion" as a means to reduce tobacco density in the cigarette while maintaining the subjective and physical properties. This previous work has been done by evaluating various tobaccos that were impregnated and expanded using the existing DIET process. Partial expansion was achieved by using tower temperatures in the range of 350 - 450 °F. Several successful cigarette models were achieved, however, the emphasis during the development was mostly on tobacco blend/cigarette design. Therefore, this program was initiated to assess and develop the potential for partial expansion from a processing standpoint.

## Program Plans

In order to achieve the program objectives, outlined below is the proposed testing scheme. Standard impregnation at 400 psi and tobacco OV of 21% OV will be used. Changing these parameters requires major modification or the addition of new equipment to the existing DIET process and therefore falls under the scope of a different program.

### I. Determine Fundamental Relationships

A. Assess the effect of tobacco type
   1. DBC Bright
   2. DBC Burley
   3. Oriental
   4. Total Marlboro blend

B. Determine the effect of processing conditions
   1. Tower temperature
   2. Tower gas velocity
   3. Tobacco feed rate through tower
   4. Soak time
   5. Residence time (standard tangential vs. plug flow tangential)

C. Evaluate/Characterize products
   1. SV
   2. Equilibrated CV/OV
   3. Chemical Analysis
   4. Subjective screening

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## II. Determine the Effect of Blend Expansion

A. Apply information from fundamental studies to predict results

B. Assess the effect of blend type
   1. DBC bright and DBC burley
   2. DBC bright and Oriental
   3. Oriental and DBC burley
   4. DBC bright, burley and Oriental
   5. Total Marlboro blend

C. Assess the effect of process conditions
   1. As determined from fundamental studies

D. Evaluate Products
   1. SV
   2. Equilibrated CV/OV
   3. Chemical analysis
   4. Subjective evaluation in blends
   5. Cigarette physical/smoke evaluation of selected blends

E. Compare results to individually expanded materials that are blended together

## III. Assess the Contribution of DIET and ES

A. Choose several models (blend and process conditions) from previous studies

B. Add back DIET bright feedstock and ES feedstock (CRS) to the blend before partial expansion

C. Evaluate blends
   1. Blend equilibrated CV/OV
   2. Chemical analysis
   3. Detailed subjective evaluation
   4. Detailed physical/smoke evaluation of cigarettes

D. Compare results to same blends but with standard DIET and ESB added

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All testing during the first three phases will use tobacco cased with standard DETA casing. The addition of more traditional blend casings will be addressed only under the detailed final evaluation of one or more processing schemes.

## IV. Recommend and Evaluate the most promising scheme(s)

A. Evaluate blend similarities for all brands

B. Assess production requirements for all brands

C. Assess the effect of casings on subjective, physical, and chemical properties

D. Detail and evaluate potential processing concerns in a manufacturing environment for each scheme
   1. Blending
   2. Casings

E. Conduct complete physical, chemical, smoke, and subjective characterization with assistance from Product Development

## Timescales

Outlined below is a detailed timescale for completion of the program broken down by each of the development phases previously discussed. The estimated completion dates for the various tasks assumes 2 days/week testing time on the Phase III (8" tower) DIET system. In addition, it has been assumed that standard technician support for pulling/submitting samples and running sieves will be available from the D Pilot Plant Technicians.
Gantt charts for the program schedule are attached.

## I. Determine Fundamental Relationships

| | |
|---|---|
| • test design | June 1990 |
| • testing | July-August 1990 |
| • subjective screening | August 1990 |
| • data evaluation | August-September 1990 |

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Timescales (cont'd)

II. Determine the Effect of Blend Expansion

| | |
|---|---|
| •test design | September 1990 |
| •testing | October 1990 |
| •cigarette preparation/physical evaluation | November 1990 |
| •subjective evaluation | November 1990 |
| •data evaluation | December 1990 |

III. Assess the Contribution of DIET and ES

| | |
|---|---|
| •test design | December 1990 |
| •testing | January 1991 |
| •cigarette preparation | February 1991 |
| •cig. physical/smoke evaluation | February-March 1991 |
| •detailed subjective evaluation | February-April 1991 |
| •data evaluation | March-April 1991 |

IV. Recommend and Evaluate the most promising scheme(s)

| | |
|---|---|
| •evaluation of blends/production reqmts. | ongoing |
| •assess effect of casings | April 1991 |
| •detail/evaluate processing concerns | April-May 1991 |
| •final characterization of recommended schemes | May-June 1991 |
| •final report | July 1991 |

Resource Requirements

| | |
|---|---|
| Semiworks Primary: | •Blend preparation of approximately 30 small scale blends<br>•Blend preparation of approximately 20 large scale blends |
| Semiworks Make/Pack: | •Cigarette making of approximately 60 models |
| Materials Evaluation: | •Physical evaluation of the above blends and cigarettes<br>•CV and OV analysis of DIET process runs |
| Cigarette Testing: | •Smoke analysis of the above cigarettes |

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**Resource Requirements (cont'd)**

| | |
|---|---|
| Analytical: | •Chemical analysis on approximately 75 samples |
| Technician Support: | •Assistance in completing sieve and SV analysis and in sampling<br>•Assistance in coordinating blends/cigarettes thru Semiworks |
| Flavor Development: | •Assistance in identifying and addressing subjective concerns |
| Leaf Blending Group: | •Assistance in subjective characterization |
| NET panel: | •Subjective screening |

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